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Effects of Changing Age Structure on Consumption and Saving

by

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Abstract

This paper analyzes the impact on consumption and savings of projected changes in the age structure of the Canadian population. Demographically-induced changes in savings can have important implications for economic performance and affect the future standard of living of Canadians. The paper adopts the theoretical perspective given by the life-cycle hypothesis which predicts that saving will be low for both young and elderly people and highest for middle-aged individuals. The theory suggests that the future movement of members of the 'baby-boom' generation into middle-age may increase the savings rate over the medium term. However, the hypothesis predicts that in the long run the rise in the proportion of the elderly people in the population could cause the savings rate to fall.

The paper presents data from the Survey of Family Expenditure and reviews the results of several Canadian and U.S. econometric studies to investigate the link between age and savings behavior. *Contrary to the predictions of the life-cycle hypothesis, it is found that elderly people have very high savings rates -- often rivaling those of middle-aged individuals.* The effects of population aging on the aggregate savings rate are simulated by combining population projections with age-specific data on saving and income. These simulations suggest that the movement of members of the baby boom cohort into middle age could add 1 to 1 1/2 percentage points to the personal savings rate over the next 25 years. This could in turn lead to a significant increase in the stock of domestically-owned capital. The simulations also indicate that the projected rise in the fraction of elderly people in the population will not depress the savings rate significantly.

Résumé

Le present document analyse l'incidence que les changements anticipés dans la structure démographique canadienne pourraient avoir sur la consommation et l'épargne. Les changements dans l'épargne dus aux changements démographiques peuvent avoir des répercussions sérieuses sur la performance de l'économie et sur le niveau de vie futur des Canadiens. L'étude utilise comme cadre analytique la théorie fondée sur l'hypothèse du cycle de vie, selon laquelle l'épargne sera faible tant pour les jeunes que pour les personnes âgées et plus élevée pour les gens d'âge mûr. Selon cette théorie, le passage des membres de la génération du "baby boom" dans la catégorie des gens d'âge mûr pourrait faire augmenter l'épargne à moyen terme. Toutefois, l'hypothèse postule qu'à long terme, l'augmentation du nombre de personnes âgées au sein de la population pourrait provoquer la chute du taux de l'épargne.

L'auteur reprend des données tirées de l'enquête sur les dépenses des familles et les résultats de diverses études économétriques canadiennes et américaines et tente d'établir un lien entre l'âge et le comportement face à l'épargne. *Contrairement aux prédictions de l'hypothèse du cycle de vie, il constate que les personnes âgées ont de très forts taux d'épargne, equivalent souvent à ceux des gens d'âge mûr.* Les effets du vieillissement de la population sur le taux de l'épargne globale sont simules en juxtaposant à des projections démographiques des données sur l'épargne et le revenu propres à certains groupes d'âge. Ces simulations portent à croire que le passage des membres de la génération du "baby boom" à l'âge mûr pourrait augmenter le taux d'épargne personnelle de 1 à 1 1/2 point de pourcentage au cours des 25 prochaines années. Ce phénomène pourrait à son tour se traduire par une importante augmentation du stock de capital au Canada. Ces simulations révelent également que l'accroissement prévu du nombre de personnes âgées au sein de la population ne fera pas chuter radicalement le taux d'épargne.

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1. Introduction

The consensus among the authors of a wide range of population projections is that the Canadian population will age substantially over the next 40 years.[1] Since elderly people are intensive consumers of social services, this will likely lead to a significant increase in the level of social expenditure. The extent to which these higher levels of expenditure may impose a burden on the Canadian economy will depend largely on future economic growth. It is possible, however, that future economic growth might itself be influenced by changes in age structure. It is well known, for example, that income and saving typically vary over the life of an individual. Thus, it may be expected that the change in the age structure of population will have an impact upon the savings rate in the economy and thus the rate of its capital accumulation and economic growth. The purpose of this paper is to determine the effect of the projected change in age structure on the levels of consumption and saving in Canada over the next four decades.

Section 2 of this paper explores the theoretical issues related to the impact of population aging on aggregate consumption expenditure and savings rates. Section 3 provides some insight into the relationship between individual consumption spending and age through the examination of Canadian survey data collected over the past two decades. Section 4 reviews empirical studies of the link between the age of the individual and the level of consumption and savings. Section 5 integrates the results of Sections 3 and 4 with recent population projections in a simulation exercise to indicate the effects of changing age structure on savings. The main conclusions of the paper are summarised in Section 6.

2. Theoretical Perspectives

The purpose of this section is to derive the effects of population aging on aggregate consumer expenditure using two of the most popular models of consumption

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[1] See Statistics Canada, Population Projections for Canada, Provinces, and Territories 1986-2011, (Ottawa), forthcoming; Frank T. Denton and Byron G. Spencer, 'Population Change and the Canadian Economy: A Survey of the Issues,' Working Paper no. 87.A.2, (Ottawa: The Institute for Research on Public Policy for Health and Welfare Canada, 1987); and David K. Foot, Canada's Population Outlook: Demographic Futures and Economic Challenges, (Ottawa: Canadian Institute for Economic Policy, 1982).

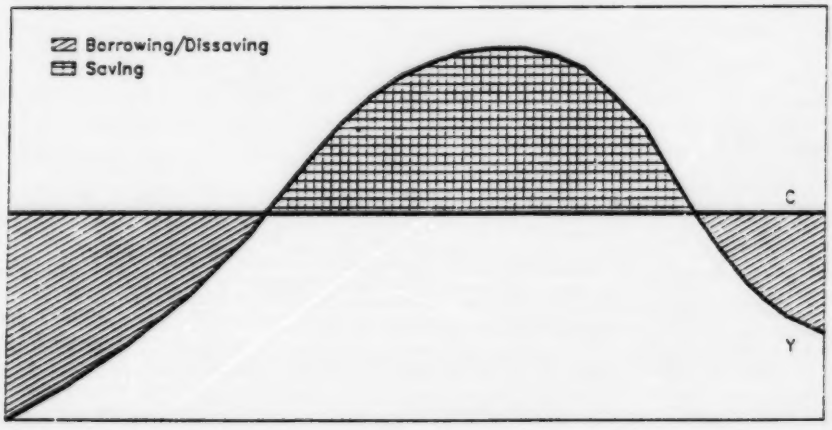
behavior -- the life-cycle and permanent income hypotheses. These theories are based on the premise that rational agents plan the time path of their consumption spending in order to maximize total lifetime utility. This focus on lifetime consumption makes the theories useful in understanding the impact of demographic changes on consumption and savings decisions.

2.1 Theories of Consumption

The life-cycle and permanent income hypotheses are both are based on the assumption that individuals plan their consumption in order to maximize total lifetime utility subject to an intertemporal budget constraint.[2] An implication of both theories is that agents wish to maintain a smooth stream of consumption over their lifetimes. If the agent believes that his current income is below the average income that he will receive over his lifetime, consumption smoothing dictates that he borrow or dissave. Alternatively, if current income is unusually high, the agent will wish to save the excess income in order to finance consumption when income is lower.

Figure 1 shows how the consumption smoothing suggested by these two hypotheses can be combined with observed age-income profiles to yield a systematic relationship between an individual's age and his savings behavior. An individual's

Figure 1



[2] Milton Friedman, A Theory of the Consumption Function, (Princeton: Princeton University Press, 1957) and Franco Modiglianni and Richard Brumberg, 'Utility Analysis and the Consumption Function,' in Kenneth K. Kurihara ed. Post-Keynesian Economics, (New Brunswick, New Jersey: Rutgers University Press, 1954).

income is typically low when he is young and has had little opportunity to accumulate human capital. By borrowing on the strength of his future earnings, the agent can consume more than his income during this initial period and experience a higher level of utility. As the agent gains work experience and reaps the returns from his investment in formal education and training, his productivity and wages will tend to rise. Eventually, the individual's current income will exceed the desired level of consumption and the agent can begin to save for his retirement, when income will once again be low.

These hypotheses generate unambiguous predictions concerning the relationship between the age structure of a population and the aggregate savings rate. An increase in the proportion of the population who are in their pre-retirement years will tend to reduce the aggregate propensity to consume while an increase in the proportion of youth or elderly people will increase the propensity to consume. The increase in the proportion of the population over the age of 65 which will occur when members of the 'baby boom' generation begin to retire could therefore result in a contraction in the supply of domestic savings.

2.2 Other Issues

The life-cycle model is a natural framework within which to examine the impact of changing age structure on aggregate consumption expenditure, since it explicitly incorporates the possibility that age affects an individual's consumption. It is appropriate, however, to discuss some issues relating to the ability of the theory, in its simplest form, to predict the impact of changing age structure on consumption expenditure. The main issues include imperfections in capital markets, uncertainty regarding the length of lifetime, the neglect of the existence of households, the desire of agents to leave bequests to their children, and the introduction of public and private pension plans.

2.2.1 Imperfections in Capital Markets

The existence of imperfections in capital markets may mean that the life-cycle and permanent income hypotheses do not exactly predict the observed pattern of consumption and wealth accumulation. Both theories assume that all desired saving or borrowing can be undertaken at a single market interest rate where the interest rate adjusts to take account of changes in loan risk. However, costs associated with recouping the value of loans from borrowers' labour earnings means that future labour earnings are of limited value as collateral for consumption loans. To the extent that capital-market imperfections are significant, institutional factors may generate an asymmetry in the saving borrowing decision inherent in both the life-cycle and permanent income models. While it may be possible to save in periods of high income, it may not be possible to dissave in periods when income and wealth are low. As a result, the consumption of the agent will rise in a way more closely associated

with earnings than would be the case if capital-market imperfections were absent.[3] Harris and Applebaum (1978) show that capital-market imperfections that result in a negative correlation between the interest rate faced by the agent and his financial wealth can generate a consumption profile that is more correlated with income than that predicted by the life-cycle hypothesis assuming perfect capital markets.[4]

2.2.2 Uncertainty Regarding Length of Lifetime

The uncertainty experienced by agents regarding the length of their lifetimes may alter the predictions of the life-cycle hypothesis. It is sometimes argued that risk-averse agents respond to uncertainty of income by increasing savings, in order to avoid the prospect of exhausting their wealth before death. In fact, the theoretical relationship between lifetime uncertainty and savings is ambiguous. The agent may increase savings to provide the means for consumption in an unexpectedly long lifetime, or the possibility of an early death may have the same effect as an increase in the subjective discount rate and induce greater *current* consumption.[5]

2.2.3 The Importance of Children and Bequests

The existence of the family as a decision-making unit is neglected in the life-cycle hypothesis, as it is in most economic models. Family size, especially the number of children, can be expected to have a significant influence on consumption spending versus savings. Expenses incurred in the raising of children are usually considered current consumption and, other things being equal, the greater the number of children, the greater will be the propensity to consume out of household income.[6] A

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3 Evidence showing that aggregate consumption expenditure displays an excessive sensitivity to current income is presented in Robert Hall, 'Stochastic Implications of the Life Cycle-Permanent Income Hypothesis,' Journal of Political Economy, Vol. 86, no. 6, (1978), pp. 971-987. The excess sensitivity can be interpreted as being the result of liquidity constraints existing in imperfect capital markets.

4 Richard Harris and Elie Applebaum, 'Imperfect Capital Markets and Life-Cycle Saving,' The Canadian Journal of Economics, Vol. 11, No. 2, (1978), pp. 319-24.

5 For a formal exploration of the relationship between life-cycle consumption and uncertainty of lifetime, see David Levhari and Leonard Mirman, 'Savings and Consumption with an Uncertain Horizon,' The Journal of Political Economy, Vol. 85, no. 2, (1977), pp. 265-81 and James B. Davies, 'Uncertain Lifetime, Consumption, and Dissaving in Retirement,' The Journal of Political Economy, Vol. 89, no. 3, (1981), pp. 561-83. It was found that the effect on consumption of lifetime uncertainty depended on a complex relationship between the degree of risk aversion, the subjective rate of time preference, and the real interest rate.

6 It is not clear theoretically whether children should be considered consumption or investment goods. Spending which increases the future productive capacity of the child, such as spending on education, should be regarded as investment in human capital, rather than current consumption. Therefore, investment in children that yields a later dividend to the parents (perhaps in the form of support during retirement) should be regarded as parental savings.

continuation of the trend of declining fertility rates may therefore reduce the propensity to consume and increase savings.

The life-cycle model ignores motives for saving, apart from the desire to finance consumption during retirement. It is possible, therefore, that the actual level of savings will exceed that predicted by the life-cycle theory. The desire of parents to leave bequests to their children provides a reason why the pure life-cycle hypothesis may underestimate savings. In particular, dissaving by the elderly may be inhibited by their wish to leave inheritances. The life-cycle model may be modified to take account of the bequest motive by incorporating the utility (or alternatively, the wealth) of the agent's offspring into his own intertemporal utility function.[7] An empirical test of this hypothesis provided only weak supporting evidence, however.[8]

2.2.4 The Implications of Pensions for Life-Cycle Savings

The unanticipated introduction and growth of private and public pensions may cause the levels of consumption and saving to diverge from that implied by the simple life-cycle model. The life-cycle hypothesis states that agents plan their lifetime consumption at the beginning of their economic lives given knowledge of their future labour income and current financial wealth. If a pension plan is established after the agent has begun to implement his consumption pattern, the change in the economic environment will generally result in a change in consumption, although the direction of the change is theoretically ambiguous. According to Feldstein (1974), economic theory predicts that for a retirement period of a given duration, the institution of a pension scheme will reduce nonpension saving. The existence of pensions may, however, induce people to retire earlier and accumulate more wealth to augment pension income in a longer retirement period.[9] The period of transition to the new consumption plan may be characterized by very large changes in saving as the now outdated consumption plan is rapidly revised. Agents who wish to reduce their stock of financial wealth and rely on pension income for support during retirement may increase consumption sharply after the unexpected institution of a pension plan and allow their financial wealth to be drawn down.

Compulsory pension plans, regardless of whether they were anticipated, may alter the pattern of personal life-cycle consumption by generating forced saving. The life-cycle model predicts that young individuals, whose income is low relative to their

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7 This is the means by which the Ricardian Equivalence Theorem was revived in Robert J. Barro, 'Are Government Bonds Net Wealth?' The Journal of Political Economy, Vol. 82, no. 6, (1974), pp. 1095-1117.

8 Alan S. Blinder, Roger H. Gordon, and Donald E. Wise, 'Social Security, Bequests, and the Life Cycle Theory of Savings: Cross- Sectional Tests,' Working Paper no. 619, (Cambridge, MA.: National Bureau of Economic Research, 1981).

9 Martin Feldstein, 'Social Security, Induced Retirement, and Aggregate Capital Accumulation,' The Journal of Political Economy, Vol. 82, no.5, (1974), pp. 905-926.

expected lifetime resources, will have low levels of saving. Pension plans, however, are usually financed by compulsory deductions of a fixed proportion of labour income. Accumulation of financial wealth inclusive of pension rights may occur earlier in life than the agent would otherwise wish and nonpension saving later in life may be reduced because retirement needs have already been met.

Evidence that public pensions reduce personal saving and increase consumption during individual's working years was found by Feldstein (1974) and Munnell (1976) for the United States and by King and Dicks-Mireaux (1982) for Canada.[10] On the other hand, studies by Barro (1978) in the United States and Boyle and Murray (1979) in Canada have failed to find significant effects of pensions on saving.[11] Empirical evidence has thus not eliminated the ambiguity emerging from the theory.

The net effect of these factors appears to be that the simple life-cycle hypothesis significantly underestimates the level of personal saving. For example, White (1978) in a simulation analysis found that no plausible parameterisation of a utility function could generate life-cycle saving of more than 40 per cent of actual U.S. saving in three selected years.[12] Kotlikoff and Summers (1981) found that life-cycle asset accumulation could account for only 44 per cent of actual U.S. wealth in 1974.[13] The authors also claim that their value for life-cycle wealth is an upper bound, since the method used for calculating life-cycle wealth biases that figure upwards.

3. Observed Patterns of Income and Consumption

The purpose of this section is to examine data relating to the age profile of consumption spending in order to gain some insight into the order of magnitude of the changes in consumption and saving that might be induced by population aging.

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[10] Martin Feldstein, op. cit.; Alicia H. Munnell, 'Private Pensions and Saving: New Evidence.' The Journal of Political Economy, Vol. 84, no. 5, (1976), pp. 1013-32 and M. A. King and L. L. Dicks-Mireaux, 'Asset Holdings and the Life-Cycle.' The Economic Journal, Vol. 92, no. 366, (1982), pp. 247-67.

[11] Robert J. Barro, The Impact of Social Security on Private Saving: Evidence from the U.S. Time Series, (Washington, D.C.: The American Enterprise Institute, 1978) and Phelim Boyle and John Murray, 'Social Security Wealth and Private Saving in Canada.' The Canadian Journal of Economics, Vol. 12, no. 3, (1979), pp. 457-68.

[12] B.B. White, 'Empirical Tests of the Life-Cycle Hypothesis.' The American Economic Review, (1978), pp. 547-60.

[13] Laurence Kotlikoff and Lawrence H. Summers, 'The Role of Intergenerational Transfers in Aggregate Capital Accumulation.' The Journal of Political Economy, Vol. 89, no. 4, (1981), pp. 706-32. Intergenerational transfers comprise the difference between actual wealth and that which is a result of life-cycle saving. These transfers include parental support for college education, equity in a family business, concessionary loans, and a host of other informal arrangements.

Tables 1 and 2 present data relating to household income and expenditure by age of household head for selected years from 1962 to 1986. The data are obtained from the Survey of Urban Family Expenditures Family Expenditure in Canada, a household survey conducted by Statistics Canada approximately every two years.[14] The survey provides data for selected years on total consumption expenditure and savings of households, in current dollars.[15] These data are compared with the consumption income ratio obtained from The National Income and Expenditure Accounts.

3.1 Households of Two or More Persons

For households of two or more persons, income in the cross-sectional sample increases with the age of the household head, achieving a maximum when the head is aged between 45 and 54, as shown in Table 1. Families with heads in the age range 55-64 have lower income than those whose heads are 45-54. The incomes of families with heads older than 65 are, on average, about 35 per cent lower than those of families whose head is 55-64 and approximately 45 per cent lower than families whose head is aged 45-54. If households' longitudinal income profiles reflect the 'humped' time paths exhibited by the cross-sectional data, then the life-cycle hypothesis predicts that substantial dissaving will occur for households whose head is older than 65.[16]

It is clear from Figure 2 that the U-shaped age profile of the average propensity to consume implied by the pure life-cycle hypothesis is not pronounced in the family expenditure data. The average propensity to consume out of after-tax income is high during the years of young adulthood, as predicted by the life-cycle model. In five of the survey years, dissaving is observed for the class of households with a head younger than 24. In the remaining two survey years for which data on this age group are available, the average propensity to consume out of disposable income exceeded 0.95. The propensity to consume does tend to decline as the household

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[14] In most years before 1978, the sample in the survey consisted only of households in selected urban centres. After 1978, however, both urban and rural households were included in the sample, and the corresponding population consists of all households in Canada.

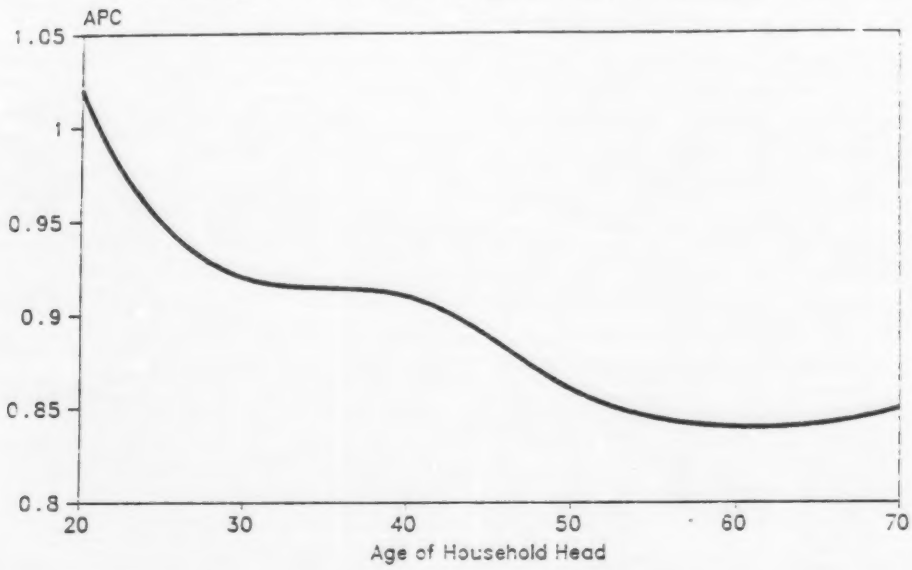
[15] Definitions of income, consumption and savings are those used by David K. Foot and Daniel Trefler, Life-Cycle Saving and Population Aging, Working Paper no. 8308, (Toronto: Institute for Policy Analysis, 1983). A full description of the data is provided with Table 1.

[16] A problem characteristic of age-stratified cross-sectional data is the difficulty involved in inferring age profiles for individuals or households from single period cross-sections. It should be noted that members of different age groups in this sample are members of different age cohorts, and changes in income between age strata need not correspond to changes in income over the life of the individual. For an example which illustrates the pitfalls of inferring individual life-cycle behavior from cross-sectional data see A. F. Shorrocks, 'The Age-Wealth Relationship: A Cross-Section and Cohort Analysis,' The Review of Economics and Statistics, Vol. 57, (1975), pp. 155-63.

head approaches middle age, presumably because of saving for retirement. In most survey years the consumption income ratio achieves a minimum when the family head is aged 55-64.

Figure 2

Average Propensity to Consume (APC) of
Multi-Person Households, by Age of Household Head, 1962-78



The large amount of saving undertaken by those households whose head is older than 65 is somewhat surprising in light of the prediction of the simple life-cycle hypothesis that agents who are retired will be dissaving to finance consumption. The propensity to consume out of current income usually increased when the household head was older than 65, relative to those households whose head was 55-64 years old, but the magnitude of the increase was unexpectedly small. In fact, in some of the survey years, the savings rate of families with a head older than 65 was higher than for those families with a younger head. The high savings rate of elderly people in the sample suggests that the projected increase in the proportion of the population over 65 may not result in the large fall in the aggregate savings rate predicted by the life-cycle hypothesis.

It is possible that the high level of nominal saving observed for elderly individuals reflects compensation for the effects of inflation on real incomes. Many elderly people, such as those with unindexed pensions, are vulnerable to the adverse effects of inflation on their standards of living. Elderly people in an inflationary environment may find it necessary to save even after retirement in order to maintain their future real income. In general, those receiving income from unindexed financial assets

must also save a portion of this return in order to preserve the real value of the asset and the income which it yields.

3.2 Unattached Individuals

Some insight into the relationship between family size and the age-consumption profile may be gained by comparing the age-consumption profiles of unattached individuals with those for heads of multi-person households. As shown in Table 2, the age profile of consumption for single-person households is more consistent with the life-cycle model than was the case for multi-person families. The marginal propensity to consume out of current income is very high for individuals younger than 45, but decreases substantially for those aged between 45 and 64. People over the age of 65 exhibit a high average propensity to consume out of current income -- one which rivals that for young people. The average propensity to consume for individuals under 45 exceeds 0.90 in all of the survey years and averages approximately 0.95. For individuals between the ages of 45 and 64, the propensity to consume averages 0.83, reflecting much higher levels of savings. The consumption behavior of elderly unattached individuals differs somewhat from that of multi-person households whose head is older than 65. The mean of the propensities to consume in the samples is 0.88 for unattached individuals over the age of 65, versus 0.85 for multi-person households. The fact that the average propensity to consume is somewhat higher for elderly unattached individuals than for multi-person families may reflect the importance of bequests as a motive for savings among multi-person households.

Total saving was positive for all classes of individuals in all sample years, despite the use of a definition of consumption spending which biases the level of observed savings downward. In particular, the survey defines the value of consumer loans as a liability, reducing net assets and appearing as dissaving, but the corresponding gain in assets although the purchase of consumer durables is considered current consumption.

3.3 Changes in the Composition of Savings over the Life-Cycle

The data in Tables 1 and 2 indicate that the composition of total saving changes substantially over the lifetime of the average household. In particular, the fraction of security payments (which include life and unemployment insurance premiums as well as public and private pension contributions) in total saving is highest during young adulthood and declines as the age of the household head increases. It is possible that a substantial portion of the savings of young adults is involuntary, consisting of compulsory contributions to pension plans and unemployment insurance programs. The dollar value of payments for security reach a maximum for the household when the head is aged 45 to 54. This can be explained by noting that contributions to pension and unemployment insurance plans are usually positively related to income and the 45 to 54 age range is when income usually achieves its peak. Savings that represent a change in net assets, such as purchases of financial assets and accumulation of equity in the home, compose a greater share of total savings as the age of household head rises. Annual changes in net assets peak

when the household head is aged 55-64, along with the total savings rate. Given the relative constancy of security payments, it is clear that variations in the type of saving that appears as changes in net assets are the main causes of variations in total saving over the lifetime of the typical sample household.

The more detailed data for 1984 and 1986 in Table 1 reveal substantial changes in the composition of saving over the life cycle.[17] In both of these years, for instance, the fraction of saving accounted for by contributions to the CPP QPP is higher for families headed by someone under age 45 than for those families headed by a person aged 45 to 64. In 1984, contributions to the CPP QPP accounted for 9 per cent of total savings in families headed by a person younger than 45, but were only 7 per cent of savings for families with a head aged 45 to 64. The data for 1986 show that while 19 per cent of the savings of families with a head younger than 45 were in the form of CPP QPP contributions, only 8 per cent of the savings of families with a head aged 45 to 64 were in this form. The importance of contributions to private pension plans is also less for households headed by an older person. For households headed by a person younger than 45, 7 per cent of their saving in 1984 and 10 per cent of their saving in 1986 consisted of contributions to private pension plans, but for households headed by an individual between 45 and 64 the corresponding figure was 6 per cent in both years. Contributions to Registered Retirement Savings Plans (RRSPs) are also much higher for households headed by a person aged 45 to 64 than for those headed by someone under 45.

The differences in the composition of saving over the life cycle suggest that changes in age structure may alter the composition of aggregate saving. The tendency for the share of security contributions in household savings to decline with age implies that security contributions will decrease as a proportion of aggregate saving as members of the 'baby boom' generation continue their movement into middle age. Contributions to RRSPs and other nonpension savings vehicles can be expected to increase in importance over the medium term, as the proportion of the population in the 45 to 64 age group rises.

4. Econometric Analyses

This section discusses the methodology and conclusions of several empirical studies which explore, directly or indirectly, the relationship between an individual's age and his consumption spending and saving. The objective is to determine more precisely the impact of population aging on the level of consumption and saving in Canada. Studies by Foot and Trefler (1983), King and Dicks-Mireaux (1982), Beach, Boadway and Bruce (1988) and Fair and Dominguez (1987) will be discussed. Each of these studies takes a different approach to determining the age-consumption-saving relationship. Foot and Trefler simply estimate naive age-consumption and age-income profiles from pooled cross-sectional data. They are then able to obtain

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[17] The more complete decomposition of saving in these survey years was provided only for multi-person households.

a residual age-savings profile. King and Dicks-Mireaux examine the age profile of financial wealth to investigate whether the amount of accumulated wealth behaves in a manner consistent with the life-cycle hypothesis and indicates dissaving by elderly individuals. Beach et al estimate a true life-cycle consumption function from pooled cross-sectional data, while Fair and Dominguez conduct a time-series estimation of an aggregate consumption function for the United States containing a series of variables representing the U.S. age structure.

4.1 Foot and Trefler

Foot and Trefler, utilizing the same data as were presented in Section 3, sought to determine separately the age profiles of household consumption and income using multiple regression analysis.[18] The data for the seven survey years between 1964 and 1978 were pooled and yielded 48 observations for after-tax income, the mean age of the household head, and total current consumption. These data were used to estimate separately the age profiles of consumption expenditure and income. In order to permit these regressions to generate 'humped' age profiles for income and consumption, the variable representing the age of the household head appears in both regressions in the form of an unconstrained fourth-order polynomial.[19] Dummy variables for each of the survey years are also included in the equations to capture any shift in the consumption-age and income-age profiles induced by other factors. Income does not appear as an argument in the consumption-age equation, as its effect is (hopefully) subsumed within the annual dummy variables. It should be stressed that the equation estimated for consumption is not a conventional consumption function, but rather an age-consumption profile which should be combined with the estimated age-income profile to yield age-specific average propensities to consume.

Table 3 presents the consumption expenditure income ratios, by age of household head, derived from the estimated equation. It should be noted that the equations for both income and consumption performed well in that the explanatory variables (i.e., the age terms and the annual dummy variables) were generally highly statistically significant and the R-squared was high. The estimated equation suggests that positive levels of savings persist after the household head has reached the age of 65. Indeed, the average propensity to consume reaches a *minimum* for households whose head is between 60 and 70 years of age. The average propensity to consume out of current income rises somewhat after age 70, but remains far below the levels it attained for households headed by young adults. An implication of the Foot and Trefler study is that population aging may actually increase the propensity to save out of income, even after many members of the baby boom cohort have retired.

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[18] Foot and Trefler, op. cit.

[19] The pure life-cycle hypothesis predicts that only the age-saving profile, and not the age profile of consumption expenditure, will have a hump. The authors did not wish to preclude this possibility, however.

4.2 King and Dicks-Mireaux

King and Dicks-Mireaux (1982) construct an age profile for household wealth using Canadian data.[20] The data were cross-sectional, and were obtained from Assets and Debts of Economic Families and Unattached Individuals (1977), a special supplement to the 1977 Survey of Consumer Finances. Household wealth was defined to include cash, bank deposits, bonds, stocks, vehicles, real estate (including owner-occupied housing), less debts. Consumer durables, other than automobiles, are excluded from wealth, as are private and public pension wealth. The authors, after controlling for permanent income, found that household financial wealth increases very rapidly when the household head is between 27 and 50 years old, but the rate of accumulation decreases after the age of 50.[21] Net assets reach a maximum for households whose head is aged between 60 and 65, exactly as predicted by the life-cycle hypothesis. Wealth declines for households whose head is older than 65, with the rate of decrease falling for households older than 75. The level of wealth nonetheless remains high even for households whose head is quite old. Households whose head is 80, for example, retain more than 75 per cent of the wealth they held at the beginning of retirement. At the observed rate of asset decumulation, the households of the sample will still have substantial assets at the end of their lifetimes.

The cross-sectional data presented by King and Dicks-Mireaux support the conclusions of the Foot and Trefler study and our own examination of raw data -- that the degree of saving by the elderly exceeds the level which is consistent with the life-cycle hypothesis. While King and Dicks-Mireaux found evidence that negative saving from asset wealth does occur for elderly households, the magnitude of dissaving is very small.[22] The conclusions of the King and Dicks-Mireaux study were supported by similar studies completed by Burbidge and Robb (1985) using Canadian data, and Mirer (1979) for the United States.[23] An intriguing finding of the Burbidge and Robb study was that post-retirement dissaving behavior differed substantially between blue-collar and white-collar households. Blue-collar households tended to dissave after retirement while white-collar households continued to accumulate financial assets even after the household head was 75 years of age. Indeed, the rate of accumulation of financial assets was higher for white-collar households

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20 King and Dicks-Mireaux op. cit.

21 Presumably adjustment for permanent income represents an attempt to partially control for cohort effects, or at least for differences between cohorts in education and occupation.

22 One may expect that elderly persons resist dissaving from housing equity because of emotional attachment to the home. An examination of the time path of wealth excluding equity in the home still found insufficient dissaving after traditional retirement ages.

23 J. B. Burbidge and A. L. Robb, 'Evidence on Wealth-Age Profiles in Canadian Cross-Sectional Data,' The Canadian Journal of Economics, Vol. 18, no. 4, (1985), pp. 855-75, and Thad W. Mirer, 'The Wealth-Age Relation Among the Aged,' The American Economic Review, Vol. 69, no. 3, (1979), pp. 435-43.

whose head was over 70 than for white-collar households whose head was between 40 and 70.

4.3 Fair and Dominguez

Fair and Dominguez (1987) sought to determine directly the impact of a changing age structure on the U.S. aggregate consumption function.[24] Using time series data for the 1954-87 period, a consumption function was estimated expressing consumption expenditure (disaggregated into spending on durables, nondurables, and services) as a function of nonlabour income, wages, after-tax interest rates, and a series of variables representing the U.S. age structure. The U.S. population was divided into seven age groups and the proportion of the population in each of the age groups was incorporated into the consumption function. The form of the consumption function was such that demographic factors could alter the intercept of the aggregate consumption function, but not the marginal propensity to consume. The vector of demographic variables was found to be statistically significant as a determinant of aggregate consumption spending on durable and nondurable goods. The greater the proportion of the population between 30 and 55 years old, the greater was the level of savings, a finding which accords with the life-cycle hypothesis. The fraction of the population between 55 and 64 had a strong negative effect on savings. No statistically significant relationship, however, was found between the fraction of the population over 65 and consumption expenditure

The Fair and Dominguez results indicate that the age structure of the U.S. population has significant effects upon aggregate consumption expenditure, although the influence of certain age groups was not in the expected direction. The results obtained by Fair and Dominguez are similar to those found by Boskin and Lau (1988) who also estimated an aggregate consumption function for the United States.[25] The ratio of consumption expenditure to wealth was regressed upon a series of variables including the share of total wealth held by households, by age of household head, for the 1947 to 1980 period. Again, the variables reflecting the U.S. age structure were statistically significant as a group.

4.4 Beach, Boadway and Bruce

Beach, Boadway and Bruce (1988) estimate a life-cycle consumption function in which the marginal propensity to consume out of both human and financial wealth is

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[24] Ray C. Fair and Kathryn M. Dominguez, 'Effects of the Changing U.S. Age Distribution on Macroeconomic Equations,' Working Paper no. 2280, (Cambridge, MA.: National Bureau of Economic Research, 1987).

[25] Michael J. Boskin and Lawrence J. Lau, 'An Analysis of Postwar U.S. Consumption and Saving Part I' Working Papers no. 2605, (Cambridge, MA.: National Bureau of Economic Research, 1988), Table 4.1, p. 54-A.

expressed explicitly as a function of age and the real after-tax interest rate.[26] The estimation uses pooled cross-sectional data from aggregate income tax return data published by Revenue Canada.[27] The sample covers the period from 1964 to 1981 and consists of annual observations for each of ten age groups. Human wealth was calculated by discounting the value of future labour earnings estimated from age-earnings profiles.[28] The taxation statistics did not provide values for the stock of financial wealth held by agents. Gross contributions to Registered Retirement Savings Plans, Registered Home Ownership Savings Plans, and Registered Pension Plans were declared in tax returns and these could be cumulated, after accounting for withdrawals, to obtain estimates of the stock of sheltered wealth by age group. Data regarding withdrawals from sheltered savings vehicles are not available from the taxation statistics, but unpublished Revenue Canada data permitted an estimate of the ratio of gross to net contributions.[29] Wealth held in other assets was calculated by capitalizing the investment income declared in the tax returns using the nominal interest rate on long-term government bonds. An age profile of unsheltered wealth was then estimated econometrically.[30] *Unsheltered saving* was calculated from the year-to-year change in nominal unsheltered wealth given by the regression equation for each agent, after an adjustment for interest rate changes. Consumption was calculated as a residual -- the difference between income after taxes and sheltered and unsheltered saving.

Table 4 gives the estimated marginal propensities to consume out of both types of wealth, as well as the sample averages for human and financial wealth. All values are in constant 1971 dollars. The level of human wealth declines with age for members of a given age cohort, while financial wealth was found to rise throughout the entire lifetime. The marginal propensity to consume out of human wealth was smallest for those under 25 and increased linearly with age, rising nearly nine-fold between the ages of 20 and 70. This is not inconsistent with consumption smoothing, however, given that the typical agent's human capital decreases with age. The marginal propensity to consume out of financial wealth, in contrast, *declines* by 18 per cent between the ages of 20 and 70.

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26 Charles Beach, Robin Boadway and Neil Bruce, Taxation and Savings, (Ottawa: Economic Council of Canada, 1988).

27 The source used was Revenue Canada, Taxation Statistics, (Ottawa: 1966-1983), Table 4.

28 For computational simplicity the authors used a constant discount rate for this calculation. Ideally, however, the expected interest rate prevailing in each year should be used as the discount rate.

29 For many individuals, sheltered saving began prior to the sample period. An equation relating sheltered saving to age and time was estimated for the sample period and sheltered saving prior to the 1964 to 1981 period was extrapolated from this and cumulated to obtain sheltered wealth.

30 The stock of unsheltered wealth inferred from the taxation statistics was regressed on a time trend and a quadratic term in agents' ages.

Table 5 provides values for consumption, saving, income, and the consumption/income ratio, by age group. The average propensity to consume out of current income declines continuously after the age of 25 and those over 65 were found to save more than 40 per cent of their income. It is curious, that while sheltered saving declines greatly after age 65, unsheltered saving rises to its highest level and is about 40 per cent higher than that for 60 to 64 year-olds. It should be pointed out that unsheltered saving was obtained indirectly from the estimate of financial wealth, which in turn was estimated indirectly from data in the taxation statistics. The values given for unsheltered saving may differ from the correct values either because of errors in the estimation of the age profile of financial wealth or errors in the calculation of unsheltered saving from changes in estimated financial wealth. Beach et al did not publish sample averages for age-specific unsheltered saving, so the values given in Table 5 were derived from an estimated equation for unsheltered wealth (which was published) using the method prescribed by the authors.[31]

There is some reason to believe that the values for financial wealth given by the estimated age profile for those over 65 that are used to calculate unsheltered saving for this group may not correspond to the actual stocks held by representative members of this age group. One explanation for the very high level of saving on the part of elderly persons is that the sample consisting of filers of tax returns contains a disproportionate number of individuals with high incomes (particularly large investment incomes) and that this bias is more serious in the youngest and oldest age categories. In 1981, nearly 90 per cent of those aged 25 to 64 filed income tax returns, but only 69 per cent of those under 24 and 62 per cent of those over 65 did so.[32] A comparison of the average incomes, by age group, obtained in the sample of tax filers with those from the broader sample used in Income After Tax, Distributions by Size in Canada, indicates that the sample of elderly tax filers is quite unrepresentative of the total elderly population, being largely composed of high-income individuals.[33] In addition, the small sample from the over-65 age group suggests that

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31 The published equation for the age-financial wealth profile estimated by the authors generated average values for financial wealth which were grossly inconsistent with those that were related in the text of the report. We supposed that a typographical error in the published equation was the cause of this discrepancy, but consultations with the authors failed to clarify this issue. It was hypothesized that a particular typographical error was responsible and the equation for financial wealth which we used to impute unsheltered saving was corrected for this probable error. Our 'corrected' equation was capable of closely reproducing the stocks of financial wealth reported by the authors.

32 This underrepresentation of the young and old in the taxation statistics was not as serious in the early years of the sample when the proportion of the population who filed income tax returns was lower, but more uniform across age groups.

33 Statistics Canada, Income after Tax, Distributions by Size in Canada, (Ottawa, 1972). Table 22 reports that in 1972 (the mid-point of the Beach sample), the average after-tax income of individuals over age 65 was $2,790 (1971 dollars). However, Beach et al report that in their sample the after-tax incomes of individuals over 65 averaged $3,617 (1971 dollars) over the

the equation relating age to unsheltered wealth may not predict closely the asset wealth of elderly people.

Beach et al also investigate the relationship between the age of the individual and the responsiveness of saving to changes in the interest rate. Theoretically, the nature of the relationship between saving and the interest rate is ambiguous, due to the existence of three competing effects. An increase in the interest rate represents a decline in the cost of future consumption and this *substitution effect* will tend to reduce the marginal propensity to consume out of wealth and increase saving. On the other hand, an *income effect* exists since an increase in the interest rate increases real income.[34] The income effect would tend to increase the marginal propensity to consume and decrease saving. Lastly, the agent's human wealth will be decreased by the increase in the rate at which future labour earnings are discounted and this *human wealth effect* tends to reduce consumption and increase saving.

Beach et al found that the marginal propensity to consume out of human wealth is positively related to the interest rate regardless of the age of the individual. The propensity to consume out of financial wealth, by contrast, is negatively related to the interest rate for very young agents, but varies positively with the interest rate for those over 27. A rise in the interest rate increases asset income and the income effect tends to increase consumption in all periods. Older agents have higher levels of financial wealth and hence this income effect tends to dominate.

Table 6 contains age-specific interest elasticities of saving. For young individuals it was found that an increase in the interest rate increases saving. For these agents, human wealth is the primary determinant of consumption and thus it is mainly the decline in consumption brought about by the fall in the agent's human wealth that results in the strong positive response of saving to interest rates. In addition, the income effect, which would tend to reduce saving, is relatively weak for young individuals because of their low levels of financial wealth. Older people have less human wealth and therefore the positive human wealth effect of interest rate changes on saving is small. The marginal propensity to consume out of human wealth rises substantially with the interest rate for older people and this causes saving to decline. These results differ somewhat from those of Boskin and Lau who found that saving responded *negatively* to the real interest rate for those under 24, but positively to the

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1964-81 period. There is also evidence that the financial wealth of elderly individuals in the sample obtained by Beach et al is far higher than that of elderly people in general. According to data published in Statistics Canada, The Distribution of Wealth in Canada, (Ottawa, 1984), Tables 5 and 26, individuals over age 65 had an average financial wealth of $16,720 (1971 dollars) in 1984. This is much less than the $31,467 of financial wealth found by Beach et al for members of the over 65 age group during their earlier sample period.

[34] The price of consumption one period in the future in terms of current consumption is the inverse of one plus the interest rate. An increase in the interest rate will therefore increase real income and the income effect will tend to increase the marginal propensity to consume out of income.

interest rate for those between 24 and 54.[35] As was the case in the study by Beach et al. saving in the Boskin and Lau study responded negatively to interest rates for those over 55.

5. Simulation Results

This section presents the results of several simulation exercises whose objective is to determine the order of magnitude of changes in the supply of savings resulting from changes in age structure. This undertaking involved the use of results obtained from the examination of the Family Expenditure Survey data, as well as those from the Foot and Trefler (1983) and Beach, Boadway and Bruce (1988) studies.

Table 7 presents the results of the simulation carried out using the raw data in Tables 1 and 2. The average age-specific ratios of consumption expenditure to disposable income over the 1964 to 1986 sample period were weighted by relative income and the proportion of families whose head is in the relevant age group to obtain an aggregate propensity to consume for the period from 1962 to 2036.[36] The population projection used was Statistics Canada's Projection No. 2, which is available from the CANSIM data base and is soon to be published in Population Projections for Canada, Provinces, and Territories 1986-2011.[37] This is Statistics Canada's benchmark population projection, and assumes that fertility and immigration rates remain near current levels for the entire projection period. The use of population projections embodying different demographic assumptions does not affect the simulation results significantly.[38]

When the projections of age structure are combined with the age-specific ratios of consumption expenditure to income derived from the raw data, it becomes clear that the projected change in age structure could result in an increase in the aggregate savings rate. When age-specific savings rates for multi-person households are used, the simulated personal savings rate increases from 11.7 per cent of disposable income in 1988 to 12.9 per cent of disposable income in 2036 due to the change in age structure. This is an increase of about 10 per cent over the period. Use of

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35 Michael J. Boskin and Lawrence J. Lau, 'An Analysis of Postwar U.S. Consumption and Saving Part II,' Working Paper no. 2606, (Cambridge, MA.: National Bureau of Economic Research, 1988), Figure 4.8, p. 61-A.

36 This assumes that the pattern of household formation, by age, remains constant over the projection period.

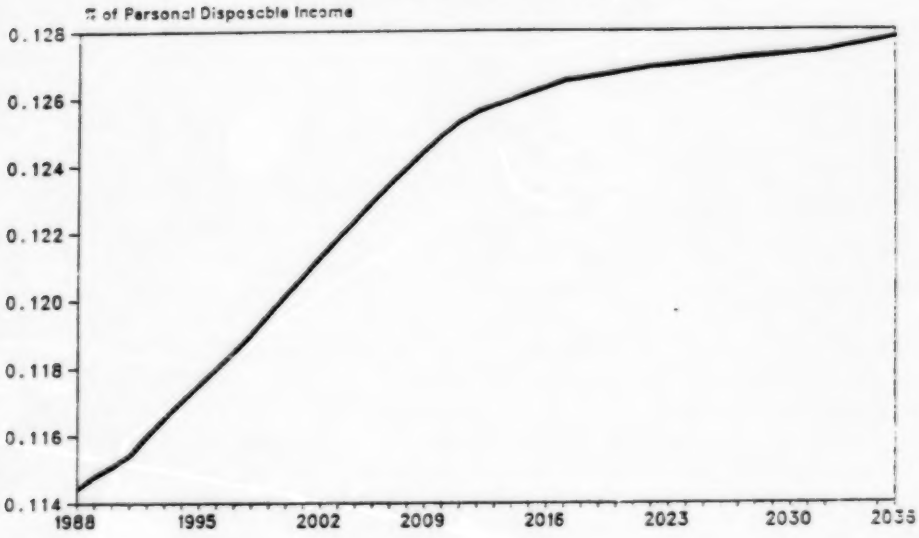
37 Statistics Canada, Population Projections for Canada, Provinces, and Territories, 1986-2011, forthcoming. Despite its title, this volume also gives projections for the period through to 2036.

38 The total fertility rate is assumed to remain at 1.66 births per woman while net immigration is 66,000 people per year.

age-specific savings rates for unattached individuals results in an increase of about 15 per cent in the personal savings rate over the same period, from 10.1 per cent of disposable income in 1988 to 11.6 per cent of disposable income in 2036. The true aggregate consumption expenditure income ratio is a weighted average of the propensities to consume for both multi-person and single-person households. The ratio obtained in this way is clearly dominated by the multi-person households. It declines substantially over the projection period and, as shown in Figure 3, the implied savings rate rises from 11.4 per cent of disposable income in 1988 to 12.8 per cent in 2036, an increase of over 12 per cent.[39] Nearly all of the increase in the savings rate occurs before 2011.[40]

Figure 3

Projected Increase in the Personal Saving Rate
Resulting from Changes in Age Structure



39 The tendency for the saving income ratio to rise is dampened somewhat by the fact that a larger proportion of elderly households are composed of unattached individuals. As the population ages, households consisting of unattached individuals receive a greater weight in calculating the overall consumption income ratio and these households have a lower savings rate.

40 It should be noted that the savings rates derived from the Urban Expenditure Surveys will tend to exceed those obtained from the National Income and Expenditure Accounts because contributions to the Canada and Quebec Pension Plans and for Unemployment Insurance are regarded as personal saving for our purposes, while under national accounts definitions they are regarded as payroll taxes and are therefore subtracted from personal income when personal disposable income is being calculated.

Table 8 presents the results of a similar exercise conducted using the age-specific savings rates estimated by Foot and Trefler. The effect of demographic change on the aggregate savings rate is roughly the same as that implied by the raw data. Given the age-specific savings rates, the aggregate savings rate rises by approximately 9 per cent between 1988 and 2036 due to changing age structure. Once again, most of the increase in the savings rate occurs before 2011.

Considerably more impact is projected when the Beach, Boadway and Bruce results are used. Simulated consumption income ratios based on the age-specific propensities to consume found by Beach, Boadway, and Bruce are given in Table 9. Like the values in Tables 7 and 8, the aggregate consumption income ratios were calculated by weighting the age-specific consumption income ratios from the study by relative income and the proportion of the population in the relevant age group. The personal savings rate is projected to rise from 16.7 per cent in 1988 to 21.6 per cent in 2036 as a result of the changing age structure -- an increase of 29 per cent.

As indicated by the projections in Tables 7 through 9, the movement of members of the baby-boom cohort into middle-age could lead to significant increases in the savings rate. The remaining two simulations investigate the implications of these demographically-induced changes in the flow of savings for the stock of capital. Table 10 shows projections for the stock of household wealth based on the savings rates in Table 7. In order to generate projections for the future stock of household wealth, future flows of savings are estimated by combining projected savings rates with projections for real personal disposable income. Changes in real personal disposable income are approximated here by changes in commercial sector output. In order to isolate the contribution of demographic variables to changes in the stock of domestic capital, growth in real output is limited to that resulting from changes in the size and the age structure of the labour force. The projected savings flows are in turn cumulated to obtain projections for the future stock of domestic capital.[41]

The projected increase in the savings rate results in a 21 per cent increase in the total stock of household wealth over the 1988-2036 period. The rise in the stock of household wealth is especially rapid after 2011, when the rise in the savings rate

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[41] Future real output growth depends on both labour force growth and changes in labour productivity. Projections of future labour force size are made by combining population projections by age with age-sex-specific participation and unemployment rates. Men's participation rates by age are assumed to remain at their 1988 levels, while adult women's participation rates are assumed to rise gradually. In particular, it is assumed that as women now aged 25 to 34 grow older, the ratio of their participation rates to those of men the same age remains at 1988 levels. Unemployment rates for each age-sex group are assumed to remain constant relative to those of men aged 45-54. The unemployment rate of men in the 45 to 54 age group is assumed to decline slightly over the next five years and remain constant thereafter. Labour productivity was held at its current level, except for small adjustments to take account of projected changes in the age-sex composition of the labour force. These adjustments were made on the basis of relative earnings. Initial values for the stock of household wealth are obtained from Statistics Canada. The Distribution of Wealth in Canada, op. cit., Table 3, p. 30.

begins to exerts a delayed effect on the stock of wealth. Despite the rise in the total stock of wealth, growth in the total population is projected to cause a decline in the level of *per capita* household wealth between 1988 and 2011. Only after 2011, when population growth slows and the rate of total household wealth accumulation accelerates, does per capita wealth begin to rise. However, per capita household wealth is only slightly above its 1988 level at the end of the projection period in 2036.

The projected increase in the stock of household wealth may be placed in perspective by comparing it with changes in real personal disposable income. Growth in the proportion of the population of working age is projected to result in small increases in per capita disposable income over the 1988-2006 period. Per capita income falls after 2006, however, as the fraction of working age people in the population declines. Slow growth in the stock of wealth, combined with increases in income, causes a reduction in the ratio of household wealth to personal disposable income between 1988 and 2011. The ratio of wealth to income falls from 2.69 in 1988 to only 2.31 in 2011. The wealth-income ratio rises after 2011, due to slower income growth and more rapid wealth accumulation. By the end of the projection period in 2036 the ratio of household wealth to personal disposable income income is 9 per cent above its 1988 level.

Table 11 provides a projection for the per capita stock of financial capital through to 2036 using the results of Beach et al. This projection is constructed using a somewhat different method than that used for Table 10. Instead of cumulating savings flows as was done for Table 10, the values in Table 11 are obtained by weighting the stocks of financial wealth found by Beach et al for representative members of each age group by the fraction of the population in that age group. The projected changes in the per capita stock of financial capital thus occur purely as a result of changes in the age structure of the population. According to this projection, the per capita stock of financial wealth, which is a measure of the pool of domestic funds available to finance investment in physical capital, rises by 59 per cent between 1988 and 2036. The ratio of financial wealth to after-tax income rises by 57 per cent over the projection period -- from 1.72 to 2.70.

The results in Tables 10 and 11 suggest that the change in age structure may result in an increase in the economy's productive capacity by augmenting the capital stock or, in the case of a small open economy such as Canada's, a reduction in the net foreign debt. However, the large increase in the capital stock found using the results of Beach et al follows from the extremely high level of unsheltered saving found by the authors for older tax-filers, which may be subject to considerable error. This caveat, and the possibility of sample selection bias arising from the use of taxation statistics, should be borne in mind when interpreting the results of these latter simulations. The values in Table 11 should therefore be interpreted only as upper bounds for the effect of changes in age structure on capital formation.

6. Concluding Remarks

The life-cycle hypothesis of consumption suggests that changes in age structure will have effects upon the aggregate propensity to consume. The higher the fraction of youth and elderly people in the population, the higher will be the propensity to consume. The life-cycle hypothesis predicts that aggregate savings rates will rise in the medium term, as members of the 'baby boom' cohort enter middle age, but then savings rates will decline when members begin to retire.

An examination of the raw data relating to household consumption behavior and a review of the empirical literature has indicated that the life-cycle model provides good predictions for the age-profile of the ratio of consumption expenditure to disposable income for young- and middle-aged people. Nearly all of the studies, however, indicate that elderly persons save substantially more than predicted by the simple life-cycle hypothesis. Explanations for the high amount of saving done by the elderly include the desire of people to leave bequests, uncertainty regarding the length of lifetime, and the erosion of purchasing power by inflation.

The simulation analysis in Section 5 showed that the consumption expenditure income ratio will decrease somewhat over the 1988 to 2036 period due to demographic influences. The movement of members of the baby-boom cohort into their high saving years is projected to increase the national savings rate, and the rate is not expected to decline when these people retire. An implication of these findings is that the capital output ratio may be increased slightly by the change in age structure. A separate review of population projections found that no plausible change in the underlying demographic assumptions could prevent a substantial increase in the fraction of the population that is elderly. This suggests that our conclusions regarding savings rates are relatively insensitive to changes in fertility and mortality rates, or immigration levels.[42]

In order to evaluate the projected changes in the personal savings rate, it is useful to compare these changes with those that have occurred in the past. The ratio of personal saving to personal disposable income displayed a general upward trend between the early 1960s and the early 1980s. In the 1960s the ratio fluctuated around 6 per cent of disposable income, but it began an upward trend in the 1970s which continued until the savings rate reached nearly 18 per cent of disposable income in 1982. After 1982, the rate fell rapidly and reached about 9 per cent of disposable income by 1988. These large historical changes clearly dwarf even the largest of the increases in the savings rate projected as a result of demographic factors. It is appropriate to conclude, therefore, that any increase in the aggregate savings rate brought about by the change in age structure will be small relative to the historical variations attributable to other factors.

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[42] Statistics Canada, Population Projections for Canada, Provinces, and Territories, 1986-2011, op. cit.

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TABLE 1

Ratios of Consumption Expenditure to Disposable Income, By Age of Household Head, 1962-84

Families of Two or More

Year	Age of Household Head						Nat. Acct.
	0-24	25-34	35-44	45-54	55-64	65 +	
1962							
Income:	4,560	5,047	5,169	5,253	5,224	4,719	
Consumer Expend.:	4,605	4,763	4,915	4,960	4,742	4,003	
Savings:	-45	284	254	293	482	716	
Security:	187	251	267	286	240	140	
Change in Net Assets:	-220	105	324	149	114	462	
Other:	-12	-72	-337	-142	128	114	
C.Y:	1.01	0.94	0.95	0.94	0.91	0.85	0.94
1964							
Income:	4,833	6,009	6,733	7,668	6,831	4,469	
Consumer Expend.:	5,013	5,702	6,362	6,852	5,663	3,821	
Savings:	-180	307	371	816	1,168	648	
Security:	236	285	379	459	379	121	
Change in Net Assets:	-312	138	121	458	590	437	
Other:	-104	-116	-129	-101	199	90	
C.Y:	1.04	0.95	0.94	0.89	0.83	0.86	0.95
1967							
Income:	5,869	7,495	8,582	9,334	7,695	5,658	
Consumer Expend.:	5,760	6,824	7,706	8,043	6,650	4,832	
Savings:	109	671	876	1,291	1,045	826	
Security:	274	445	520	583	414	174	
Change in Net Assets:	-203	525	506	598	601	504	
Other:	38	-299	-150	110	30	148	
C.Y:	0.98	0.91	0.90	0.86	0.86	0.85	0.93

TABLE 1 (con'd)

Families of Two or More

Year	Age of Household Head 0-24	25-34	35-44	45-54	55-64	65 +	Nat. Acc. Def.
1972							
Income:	7.556	9.948	11.127	12.524	10.488	6.888	
Consumer Expend.:	8.099	9.174	9.951	10.681	8.623	5.670	
Savings:	-543	774	1.176	1.843	1.865	1.218	
Security:	315	523	643	766	123	13	
Change in Net Assets:	522	381	448	823	1.107	681	
Other:	-336	-130	85	254	635	524	
C.Y:	1.07	0.92	0.89	0.85	0.82	0.82	0.91
1974							
Income:	9.684	12.271	14.139	15.449	13.075	7.393	
Consumer Expend.:	10.073	11.595	12.911	13.476	10.837	6.543	
Savings:	-389	690	1.228	1.973	2.238	850	
Security:	444	747	879	1.029	958	252	
Change in Net Assets:	127	445	811	1.213	1.672	900	
Other:	-960	-502	-426	-269	-392	-302	
C.Y:	1.04	0.94	0.91	0.87	0.83	0.89	0.88
1976							
Income:	13.082	16.099	18.659	20.184	17.562	10.995	
Consumer Expend.:	12.803	14.548	16.792	16.689	13.740	9.270	
Savings:	279	1.551	1.867	3.495	5.822	1.725	
Security:	687	980	1.172	1.294	1.263	371	
Change in Net Assets:	227	1.010	875	1.782	2.701	874	
Other:	-635	-439	-180	419	1.858	480	
C.Y:	0.98	0.91	0.90	0.83	0.78	0.84	0.89

TABLE 1 (con'd)

Families of Two or More

Year	Age of Household Head 0-24	25-34	35-44	45-54	55-64	65 +	Nat. Acct.
1978							
Income:	14,058	18,171	20,425	21,598	18,029	9,576	
Consumer Expend.:	14,112	16,833	18,520	18,546	14,714	9,488	
Savings:	-54	2,706	1,905	3,052	3,315	88	
Security:	630	951	1,034	1,194	937	214	
Change in Net Assets:	-185	834	1,297	1,984	2,370	1,411	
Other:	-499	-447	-452	-126	8	256	
C.Y:	1.00	0.93	0.91	0.86	0.82	0.99	0.87

	Under 45	45-64	65 +	
1982				
Income:	28,494	31,436	18,586	
Consumer Expend.:	24,366	24,652	13,967	
Savings:	4,128	6,784	4,619	
Security:	1,527	1,621	490	
Change in Net Assets:	2,527	4,141	3,143	
Other:	74	1,022	986	
C.Y:	0.86	0.78	0.75	0.82

TABLE 1 (con'd)

Families of Two or More

	Age of Household Head			
	Under 45	45-64	65 +	Nat. Acct.
1984				
Income:	34.348	37.862	21.101	
Consumer Expend.:	29.534	30.711	16.581	
Savings:	4.814	7.151	4.521	
Security:	2.058 (43%)	2.222 (31%)	449 (10%)	
Life Insurance:	395 (8%)	387 (5%)	93 (2%)	
U.I. Premia:	579 (12%)	620 (9%)	48 (1%)	
C.P.P. Q.P.P.:	453 (9%)	488 (7%)	33 (1%)	
Other Gov't. Pension:	300 (6%)	313 (4%)	-36 (-1%)	
Other Pension:	337 (7%)	417 (6%)	--	
Change in Net Assets:	2.116 (44%)	4.176 (58%)	3.359 (74%)	
R.R.S.P.s:	537 (11%)	1.247 (17%)	-37 (-1%)	
Other Change:	1.579 (33%)	2.929 (41%)	3.396 (75%)	
Other:	640 (13%)	753 (11%)	713 (16%)	
C Y:	0.86	0.81	0.79	0.85

TABLE 1 (con'd)

Families of Two or More

	Age of Household Head			
	Under 45	45-64	65 +	Nat. Acct.
1986				
Income:	34.328	39.842	23.480	
Consumer Expend.:	31.646	36.800	19.652	
Savings:	2.682	6.552	3.828	
Security:	2.111 (79%)	2.337 (36%)	518 (14%)	
Life Insurance:	363 (14%)	441 (7%)	128 (3%)	
U.I. Premia:	649 (24%)	650 (10%)	83 (2%)	
C.P.P. Q.P.P.:	515 (19%)	531 (8%)	69 (2%)	
Other Gov't. Pension:	295 (11%)	303 (5%)	--	
Other Pension:	267 (10%)	370 (6%)	--	
Change in Net Assets:	988 (37%)	3.805 (58%)	1.548 (40%)	
R.R.S.P.s:	600 (22%)	1.503 (23%)	--	
Other Change:	388 (14%)	2.302 (35%)	1.548 (40%)	
Other:	-417 (-16%)	410 (6%)	1.762 (46%)	
C Y:	0.92	0.92	0.84	0.87

Source: Dominion Bureau of Statistics. Urban Family Expenditures. 1962. 1964. 1967. and Statistics Canada. Urban Family Expenditure. 1972. 1974. 1976. and Family Expenditure in Canada. 1978. 1982. 1984. (Ottawa).

Description of Data. All monetary values are in current dollars. The values for consumption expenditure are those for total current consumption which includes expenses for fuel. light. water. household operation. clothing. transportation. personal care. education. and recreation. The entire purchase price of consumer durables was considered consumption spending (the alternative is to regard only the current period's portion of the stream of consumption services yielded by the durable good as part of current consumption). Income is equal to regularly occurring labour earnings. investment income. and transfer payments to the household. minus personal taxes. Indirect taxes on consumer goods and services are included as consumption expenditure. Saving is calculated as a residual - the difference between after-tax income and consumption expenditure. Saving includes changes in net assets. purchases of security. and miscellaneous expenditure. 'Changes in net assets' refer primarily to changes in the book value of assets held. including housing equity. Security payments include contributions by the household to private and public pension plans as well as life and unemployment insurance premiums. It is appropriate to regard pension contributions as saving since the discounted value of future pension payments are usually considered wealth. The category of other is a residual in the disbursement of funds. It is equal to the account-balancing difference minus net monetary transfers to the household. The value 'Nat. Acct.' is the annual average propensity to consume obtained from Statistics Canada. National Income and Expenditure Accounts. (Ottawa). Table 5. It is the ratio of 'Personal Expenditure on Consumer Goods and Services' (line item 10) to 'Personal Disposable Income' (line item 9). The breakdown of the data into six age categories was discontinued after the 1978 survey.

TABLE 2

Average Propensities to Consume Out of Disposable Income By Age of Individual, 1964-84

Unattached Individuals

Year	Age of Household Head		
	Under 45	45-64	65 +
1964			
Income:	3.324	3.502	2.478
Consumer Expend.:	3.137	3.055	2.222
Saving:	187	447	256
Security:	143	170	121
Change in Net Assets:	-38	572	-19
Other:	6	-1.055	154
C Y:	0.94	0.87	0.90
1972			
Income:	5.719	5.654	2.964
Consumer Expend.:	5.302	4.094	2.795
Saving:	417	1.560	169
Security:	287	256	15
Change in Net Assets:	125	769	-16
Other:	5	535	170
C Y:	0.93	0.72	0.94
1974			
Income:	6.907	6.815	3.897
Consumer Expend.:	6.786	5.317	3.605
Saving:	123	1.498	292
Security:	-138	276	-10
Change in Net Assets:	-94	722	282
Other:	-109	500	20
C Y:	0.98	0.78	0.93

TABLE 2 (con'd)

Unattached Individuals

Year	Age of Household Head		
	Under 45	45-64	65 +
1976			
Income:	9.152	9.094	4.881
Consumer Expend.:	8.851	7.527	4.486
Saving:	301	1.567	395
Security:	564	724	28
Change in Net Assets:	19	576	466
Other:	-282	267	-99
C Y:	0.97	0.83	0.92
1978			
Income:	10.747	8.659	5.788
Consumer Expend.:	10.335	7.376	5.043
Saving:	412	1.283	745
Security:	560	428	32
Change in Net Assets:	180	954	501
Other:	-328	-99	212
C Y:	0.96	0.85	0.87
1982			
Income:	16.090	14.067	9.356
Consumer Expend.:	15.034	11.385	7.437
Saving:	1.056	2.682	1.919
Security:	842	611	44
Change in Net Assets:	548	1.773	1.228
Other:	-334	298	647
C Y:	0.93	0.81	0.79

TABLE 2 (con'd)

Unattached Individuals

Year	Age of Household Head		
	Under 45	45-64	65 +
1984			
Income:	17.078	16.112	10.280
Consumer Expend.:	16.306	13.602	9.113
Saving:	772	2.510	1.686
Security:	902	730	12
Change in Net Assets:	889	1.355	767
Other:	-1.019	425	907
C Y:	0.95	0.84	0.84
1986			
Income:	17.979	15.252	12.066
Consumer Expend.:	17.090	13.751	10.077
Saving:	889	1.500	1.990
Security:	1.066	749	58
Change in Net Assets:	307	162	819
Other:	-484	589	1.113
C Y:	0.95	0.90	0.84

Source and Description of Data: Same as those for Table 1.
All monetary values are in current dollars.

TABLE 3

Consumption Expenditure/Income Ratios Obtained by Foot and Trefler (1983), By Age of Household Head

Age	Income	Consumption	Consumption / Income
20-24	7.750	7.400	0.95
25-29	9.450	8.500	0.90
30-34	10.850	9.500	0.88
35-39	11.800	10.200	0.86
40-44	12.250	10.400	0.85
45-49	12.150	10.100	0.83
50-54	11.500	9.450	0.82
55-59	10.350	8.550	0.83
60-64	9.050	7.250	0.80
65-69	7.500	6.000	0.80
70-75	6.200	5.250	0.85

Source: David K. Foot and Daniel Trefler, "Life-Cycle Saving and Population Aging," Working Paper no. 8308. (Toronto: Institute for Policy Analysis, 1983), Chart 1, p. 13. All monetary values are in constant 1971 dollars.

TABLE 4

Marginal Propensities to Consume out of Wealth Obtained by Beach et al (1988), By Age of Individual

Age	M.P.C. Out of Human Wealth	Human Wealth	M.P.C. Out of Asset Wealth	Asset Wealth
<25	0.0063	243.748	0.1319	582
25-29	0.0129	221.054	0.1182	1.388
30-34	0.0176	196.227	0.1060	2.575
35-39	0.0226	165.990	0.0921	4.407
40-44	0.0277	132.892	0.0786	6.745
45-49	0.0325	100.001	0.0654	9.562
50-54	0.0318	69.957	0.0472	12.761
55-59	0.0421	44.633	0.0322	16.392
60-64	0.0469	24.926	0.0253	20.760
>65	0.0543	8.548	0.0127	31.467

Source: Charles M. Beach, Robin W. Boadway, and Neil Bruce. Taxation and Saving. (Ottawa: Economic Council of Canada, 1988). Tables 4-5, 4-6 4-8, and D-2, pp. 39-41 and Appendix D and calculations by the author. Values are averages over the 1964 to 1981 sample period and all monetary values are in constant 1971 dollars.

TABLE 5

Consumption Expenditure/Income Ratios Implied by Beach et al Results (1988), By Age of Individual

Age	Pre-Tax Income	Tax Rate (%)	Sheltered Saving	Unsheltered Saving	Consumption Expenditure	Consumption Disp. Income
< 25	3.255	0.103	41	25	2.752	0.942
25-29	5.593	0.140	136	53	4.468	0.929
30-34	6.629	0.152	183	87	5.152	0.916
35-39	7.223	0.160	214	139	5.418	0.893
40-44	7.454	0.163	235	214	5.338	0.856
45-49	7.471	0.167	261	319	5.038	0.810
50-54	7.307	0.169	284	462	4.579	0.754
55-59	6.974	0.165	290	647	4.050	0.695
60-64	6.171	0.160	246	878	3.381	0.652
65 +	4.106	0.119	44	1213	2.093	0.579

Source: Beach, Boadway and Bruce, op. cit., Tables 4-3 and 4-9, pp. 38-41 and calculations by the author. Values for pre-tax income, saving, and consumption are averages over the 1964 to 1981 sample period. Pre-tax income is the sum of net earnings, capital income, and transfers and social insurance as given by Beach et al. The tax rate is the 1981 average tax rate defined as the ratio of total net tax payable (line item 59) to 'total income assessed' (line item 28) in Revenue Canada, Taxation Statistics, (Ottawa, 1983), Table 4. Beach et al do not provide values for average unsheltered saving. The values above were calculated by the author who took the change in nominal financial wealth, after adjusting for changes in interest rates using a method prescribed by Beach et al. All monetary values are in constant 1971 dollars.

TABLE 6

Age-Specific Interest Elasticities of Saving Obtained by Beach et al (1988)

Age	Interest Elasticity of Saving	
	1971	Sample Average
< 25	3.757	1.379
25-29	2.271	0.696
30-34	1.207	0.315
35-39	0.554	0.112
40-44	0 .198	-0.001
45-49	-0.014	-0.053
50-54	-0.124	-0.070
55-59	-0.184	-0.075
60-64	-0.250	-0.081
>65	-0.577	-1.210

Source: Beach, Boadway and Bruce op. cit. Tables 7-9 and 7-10, p. 77-78, eqn 5-6.

TABLE 7

Aggregate Consumption Expenditure Income Ratios Implied by Projected Age Structure Changes (Based on Family Expenditure Survey Data)

Year	Households of Two or More	Unattached Individuals	Over-all
1988	0.883	0.899	0.886
1991	0.882	0.898	0.885
2001	0.877	0.891	0.879
2011	0.873	0.885	0.874
2021	0.872	0.884	0.873
2031	0.871	0.884	0.873
2036	0.871	0.884	0.872

Sources: Tables 1 and 2 Statistics Canada Population Projections for Canada, Provinces and Territories 1986-2011 Postcensal Annual Estimates of Population by Marital Status, Age, Sex, and Components of Growth for Canada, Provinces and Territories June 1 1984 Population 1921-71 Population 1971-76 and calculations by the author

TABLE 8

Aggregate Consumption Expenditure Income Ratios Based on Projected Age Structure Changes and Foot and Trefler (1986) Results

Year	Consumption Income
	Actual
1971	0.862
1981	0.862
1988	0.860
	Projected
1991	0.858
2001	0.854
2011	0.849
2021	0.848
2031	0.848
2036	0.848

Source: Statistics Canada. Population Projections for Canada, Provinces and Territories, op. cit.; Foot and Trefler, op. cit. and calculations by the author

TABLE 9

Aggregate Consumption Expenditure Income Ratios Based on Projected Age Structure and Results of Beach et al (1988)

Year	Consumption Income
1988	0.833
1991	0.830
2001	0.817
2011	0.802
2021	0.792
2031	0.786
2036	0.784

Source: Beach, Boadway and Bruce, op. cit., Statistics Canada, Population Projections for Canada, Provinces and Territories, op. cit., and calculations by the author.

TABLE 10

Changes in the Stock of Household Wealth Resulting From Projected Increases in Aggregate Savings Rate

(1988 dollars)

Year	Total Household Wealth (billions)	Household Wealth Per Capita	Personal Disposable Income Per Capita	Ratio of Household Wealth to Income
1988	1,038.3	40,051	14,883	2.69
1991	1,038.9	38,964	15,092	2.58
2001	1,052.7	36,640	15,763	2.32
2011	1,090.7	36,172	15,660	2.31
2021	1,148.3	37,001	14,843	2.49
2031	1,219.4	39,240	14,126	2.78
2036	1,260.7	40,950	14,003	2.92

Source and Description of Data: Calculations by the author using savings rates derived from Statistics Canada. Family Expenditure in Canada. op. cit.; data on household wealth from Statistics Canada. The Distribution of Wealth in Canada. (Ottawa. 1986) and projections for real personal disposable income. Future changes in personal disposable income are approximated here by changes in real output. Projections for output are obtained in turn by combining projections of future labour force size with assumptions about labour productivity. The size of the labour force was projected by combining population projections by age with age-specific labour force participation and unemployment rates. In order to isolate the contribution of demographic factors to changes in the stock of household wealth, labour productivity was held constant except for small increases due to changes in the age composition of the labour force. Demographically-induced increases in the savings rate above its 1988 level were multiplied by real after-tax output to obtain projections for the flow of additional savings as a result of changes in age structure. Past savings flows were then cumulated, at a 2 per cent real interest rate, to arrive at a projection for the additional household wealth resulting from demographic changes. Values for real personal disposable income and household wealth are in constant 1988 dollars.

TABLE 11

Projected Per Capita Stock of Financial Capital Derived from Results of Beach et al (1988)

(1988 dollars)

Year	Financial Wealth Per Capita	Income Per capita	Ratio of Financial Wealth to Income
1988	22.250	12.900	1.72
1991	23.130	13.097	1.77
2001	26.286	13.515	1.94
2011	29.692	13.598	2.18
2021	32.714	13.337	2.45
2031	34.784	13.081	2.66
2036	35.279	13.055	2.70

Source and Description of Data: The projections were made by weighting the average income and holdings of sheltered and unsheltered wealth found by Beach, Boadway and Bruce, op. cit., for each age group by the projected proportion of tax filers in that age group. The projections for a given year illustrate the average income and stock of financial wealth which would have existed over 1964-81 sample period if the age structure projected for that year had been imposed on 1964-81. Values for income per capita and financial wealth per capita are in constant 1988 dollars.